20. A method as claimed in claim 19, wherein said metal corner reinforcements each comprise a box-shaped section and lateral and vertical flanges, said method including abutting ends of said lengths of lumber against said box-shaped sections, with said flanges extending along said lengths of lumber.

21. A method as claimed in claim 20, which includes locating said vertical flange between a vertical pair of said lengths of lumber.

REMARKS

In the Official Action under reply, claim 13 was objected to because of an informality, and the wording of this claim has hereby been amended to employ the alternative spelling "reinforcement".

In response to the rejection of claims 3, 9 and 12 under 35 U.S.C. 112, second paragraph, the dependencies of these claims have been amended to provide appropriate antecedent bases in these claims.

Claims 1, 3 - 6, 8 - 11 and 13 were rejected under 35 U.S.C. 102(e) as being anticipated by KarisAllen et al. and claims 2, 7 and 14 were rejected under 35 U.S.C. 103(a) as being unpatentable over KarrisAllen in view of Reynolds.

In this connection, it is noted that it is known, in the prior art, to make walls from components in the form of panels which are connected together in a very unreliable manner. More particularly, such prior art panels comprise a very stiff sheeting, for example plywood, connected to a frame of very low stiffness by nailing. The nailing is prone to be executed poorly because of the narrow frame element nailing surfaces (1.5") and closeness to the edge of the sheeting, which closeness is usually less than 0.75".

The strength, stiffness and energy absorption capacity of a shear wall system constructed in this manner are governed by the weakest link in the chain, i.e. the numerous nail connections between

the sheeting and the frame elements. Consequently, such prior art shear walls have, as systems, substantially lower properties than the sheeting itself.

In order to counteract these problems of the prior art stressed skin panels, the present invention proposes the use of a fiber reinforced composite material sheeting which is securely connected to the frame so as to be useful, for example, as part of an entire shear wall system.

More particularly, the present invention provides a building component which is formed from a lumber frame and a reinforced sheet of solidified fiber reinforced composite material. This reinforcement sheet is adhered to the lumber frame, thus providing a secure connection between the reinforcement sheet and the frame, and forms a skin extending across the frame between the lumber so as to resist distortion of the frame by racking forces exerted on the frame. It is found that such a building component according to the present invention provides substantially improved resistance to racking forces as compared with the above-discussed prior art panels comprising plywood nailed to frames.

This is illustrated, for example, by the graphs shown in the attached sheet, marked "SHEET A", in which Figures 1 and 2 show the deflections of standard walls employing nailed sheeting and Figure 3 shows a wall according to the present invention.

Due to the above-discussed deficiencies, the prior art building components comprising plywood nailed to lumber frames react non-linearly in response to racking loads, as illustrated by the graph on SHEET A. Such non-linearity in response signifies that the wall system changes with load and time, and this results in reduced predictability and in the introduction of an additional element of risk in structural response and reduction of wall reliability.

In contrast, with the building component according to the present invention, since there is no apparent relative movement between the skin and the frame, the response of the wall to loading is substantially linear. This increases predictability and reduces the risk. Such linear response signifies that the wall is not changing as a structural system in response to a change of load.

These differences in the behaviour of the two types of building component obviously result from the different forms of construction used for these components and clearly illustrate the advantages of the building component according to the present invention.

It is pointed out, also, that the size of the present composite material skin is not restricted to that of a plywood panel of standard size, but may be increased, so that the skin may be continuous over adjacent panels, whereas prior art constructions of the above type are, in practice, restricted to standard plywood sheet dimensions. Also, the thickness of the skin may be of the order of one-tenth of that of a plywood of a standard size.

The nailing of plywood panels to a frame, as in the prior art, is labour intensive and, as indicated above, results in unreliable connections. In contrast, the present invention employs a reinforcement layer which is adhered to the frame, thus providing a secure and continuous connection between them which is co-extensive with the face of the lumber elements of the frame.

Plywood panels exhibit low resistance to water and need additional protection by insulation layers and outside sheeting, whereas the reinforcement sheet of the present invention, comprising a solid fiber reinforced composite material, offers superior resistance to water. Also, the present reinforcement sheet can be coloured and provided with an aesthetically pleasing surface.

The present building component is not only less labour intensive to the manufacturer but can be produced in a continuous industrial process. It is, also, lighter and less labour intensive to install than the above-discussed prior art components and can be more readily repaired.

Turning now to the applied references, the KarrisAllen reference teaches only a pre-stressed wood composite laminate assembly. The Examiner has commented, in connection with this reference, that this reference teaches, in Figures 1 - 9, " lengths of lumber which can be assembled into a frame that have a fiber reinforced composite material, 14, secured entirely to at least one side of the frame members".

However, in the present invention, the reinforcement sheet is not merely secured to one side of the frame members but forms a skin extending across the frame between the frame members, and this reference contains no suggestion of such a construction.

In order, therefore, to more clearly and patentably distinguish claim 1 over the disclosure of this reference, claim 1 has been amended to recite that the reinforcement sheet is --adhered-- to the lumber lengths, the reinforcement sheet --forming a skin extending across said frame between said lengths of lumber--.

Likewise, claim 6 has been amended to recite the step of causing the coating material to solidify in adherence with the lumber --into a skin extending across said frame between said lengths of lumber--.

It is respectfully submitted that these amendments clearly and patentably distinguish claims 1 and 6 from the disclosure of the KarrisAllen reference.

Referring now to the Reynolds reference, this relates to a stressed-skin building panel which is formed of skin members 12, 14 "of 3/4" thick exterior grade plywood" (column 5, lines 14 and 15), which is secured to stiffening strength members 20 by an adhesive and, similarly, to a stiffening strength member 26. The strength members 20 and 26 are made of lumber.

The strength members 20 and 26 are not connected together to form a frame and are spaced apart from the opposite skin member by rigid foam material. The resulting panel will, therefore, be of relatively low strength.

There is, however, no suggestion whatsoever in this reference of the use of a --reinforcement sheet of solidified fiber reinforced composite material adhered to said lumber-- as is recited in claim 1, and it is therefore respectfully submitted that claim 2, which is dependent from claim 1, is thereby clearly and patentably distinguished over KarrisAllen in view of Reynolds.

The present invention also provides the possibility of providing thermal insulation adhered to the reinforcement sheet. In this manner, all of the parts of the building component can be connected together so as to provide improved structural strength and to counteract lateral, buckling deformation, acting as an angle to the reinforcement sheet, so that the present component can be provided with a still further improved system response as compared to the above-discussed prior art building components. Since, in that case, the reinforcement sheet can be fully supported over its entire area by the insulation material, thus resisting buckling of the reinforcement sheet, improved utilization of the reinforcement sheet thereby enables the use of only a very small thickness for the sheet.

The Examiner, in rejecting claims 2, 7 and 14, has suggested that "It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the frame assembly of KarrisAllen with the foam insulation panels of Reynolds so as to provide a more comfortable interior".

However, such a modification of the KarrisAllen structure would result in a skinless frame comprising foam material precariously extending between a frame at least one of the components of which would be a wood composite laminate, but would not provide a foam insulation material together with a reinforcement sheet of solidified fiber reinforced composite material adhering to the frame and to the foam insulation material, as called for by claim 2.

Likewise, claim 6 calls for the steps of --forming at one side of said frame a layer of a coating material and causing the coating material to solidify in adherence with said lumber into a skin extending across said frame between said lengths of lumber--, and claims 7 and 14 are each dependent from claim 6.

It is therefore respectfully submitted that claim 2, 7 and 14 are now clearly and patentably distinguished over these two references.

The remaining claims recite further novel and advantageous features of the present invention, and further distinguish the invention from the two cited references.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned **"VERSION WITH MARKINGS TO SHOW CHANGES MADE"**.

It is believed that this application is now fully in order for allowance, and early action to that end is courteously requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Claims 1 - 3, 6, 7, 9, 12 and 13 have been amended as follows:

1. (amended) A building component comprising a plurality of lengths of lumber assembled into a frame, and a reinforcement sheet of solidified fiber reinforced composite material [secured] adhered to said lumber lengths and forming a skin extending across said frame between said lengths of lumber so as to resist distortion of the frame by racking forces exerted on the frame.

2. (amended) A building component as claimed in claim 1, including a foam insulation material within the frame and forming a heat insulating barrier between the lengths of lumber, said reinforcement sheet adhering to said frame and to said heat insulating barrier.

3. (amended) A building component as claimed in claim [1] 2, wherein said reinforcement sheet is co-extensive with said heat insulating barrier and said lumber at at least one side of said frame.

6. (amended) A method of making a building component, which comprises the steps of connecting together a plurality of lengths of lumber to form a frame, forming at one side of said frame a layer of a coating material and causing the coating material to solidify in adherence with said lumber into a skin extending across said frame between said lengths of lumber so as to reinforce said frame against racking.

7. (amended) A method as claimed in claim [6] 7, which includes placing a mesh of said fiber material at at least one side of said frame prior to the step of forming of

said layer and subsequently coating said mesh with said coating material during the forming of said layer so as cause said coating material to impregnate said mesh and to adhere to said heat insulating barrier and said lumber.

9. (amended) A method as claimed in claim [6] 7, which includes placing a mesh of said fiber material at at least one side of said frame and subsequently coating said mesh with said coating material so as to cause said coating material to impregnate said mesh and to adhere to said heat insulating barrier and said lumber.

12. (amended) A method as claimed in claim [1] 6, which includes connecting metal corner reinforcements to said lumber at corners of said frame to reinforce said frame.

13. (amended) A method of making a building component, which comprises the steps of connecting together a plurality of lengths of lumber to form a frame and securing to at least one side of the frame a prefabricated [reenforcement] reinforcement sheet comprising a fiber reinforced composite material.

The following new claims 15 through 21 have been added:

15. A building component as claimed in claim 1, wherein said frame is rectangular and said building component includes metal corner reinforcements at corners of said rectangular frame.

16. A building component as claimed in claim 15, wherein said metal corner reinforcements each comprise a box-shaped section and lateral and vertical flanges extending along said lengths of lumber from said box-shaped section, said lengths of lumber having ends in abutment with said box-shaped section.

17. A building component as claimed in claim 16, wherein said vertical flange extends between a pair of said lengths of lumber and said lateral flange is one of a pair of lateral flanges which fit snugly onto horizontal ones of said lengths of lumber.

18. A building component as claimed in claim 16, further comprising a further vertical flange extending along one longitudinal side of said first-mentioned lateral flange.

19. A method as claimed in claim 6, which includes installing metal corner connectors at corners of said frame.

20. A method as claimed in claim 19, wherein said metal corner reinforcements each comprise a box-shaped section and lateral and vertical flanges, said method including abutting ends of said lengths of lumber against said box-shaped sections, with said flanges extending along said lengths of lumber.

21. A method as claimed in claim 20, which includes locating said vertical flange between a vertical pair of said lengths of lumber.

Certification of Facsimile Transmission

I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office on the date shown on the first page of this document.

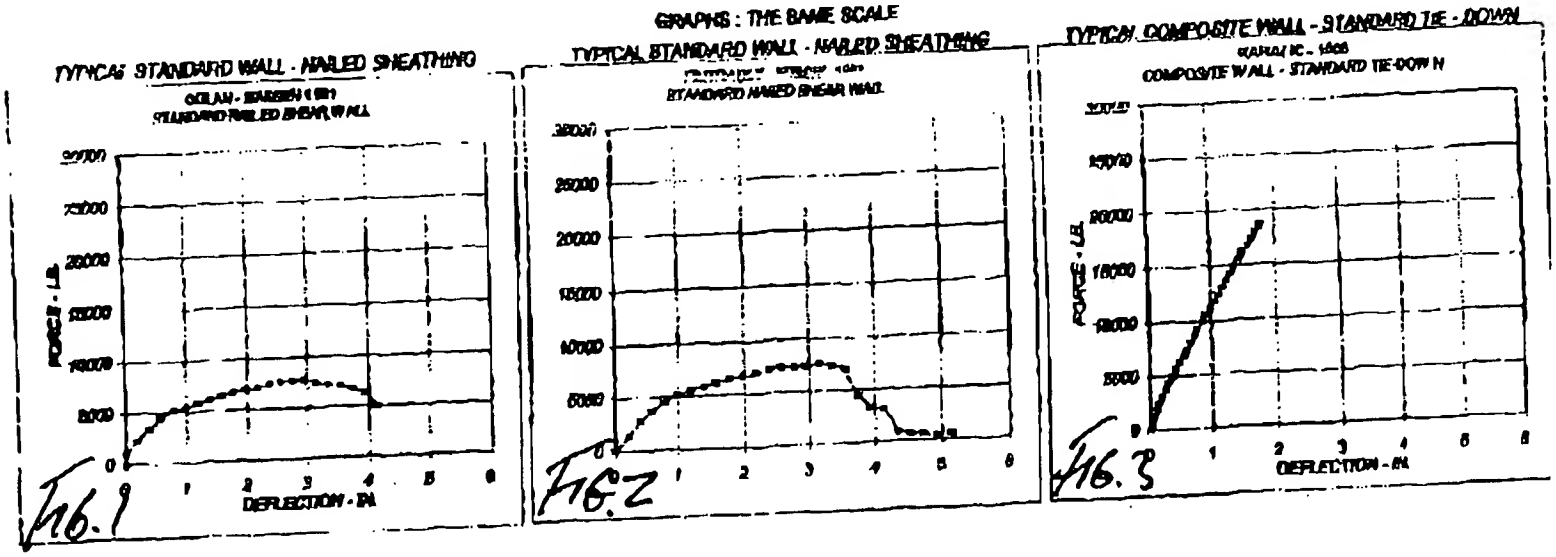
Brian M. Long

Signature

May 11, 2001

Date

SHEET A


GRAPHS : THE SAME SCALE
TYPICAL STANDARD WALL - NAILED SHEATHING
FORCE - LB.
DEFLECTION - IN.
FIG. 1
TYPICAL STANDARD WALL - NAILED SHEATHING
FIG. 2
TYPICAL COMPOSITE WALL - STANDARD TIE - DOWN
COMPOSITE WALL - STANDARD TIE-DOWN
FORCE - LB.
DEFLECTION - IN.
FIG. 3